

## Continuity of Care

# Reasons for After-Hours Calls by Hospital Floor Nurses to On-Call Physicians

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**P**reventable medical errors caused by gaps in communication are a major cause of morbidity and mortality in acute care hospitals.<sup>1</sup> Of the 4,074 sentinel events reviewed by The Joint Commission, 68% have occurred in hospitals, and communication failure was the root cause for > 65% of all sentinel events. The top 4 types of sentinel events involved patient suicide (13.1%), wrong-site surgery (12.8%), operative or postoperative complication (12.1%), and medication error (9.5%).<sup>2</sup>

Errors and adverse events due to communication failures may occur at any time of the day, but risk is likely to be higher during evening and night shifts. During these times, the nurse and on-call physician often rely on communication by telephone to address acute patient problems. The on-call physician may or may not have prior knowledge of the patient in question. The nurse may not know that the physician is not familiar with the patient or with the patient information he or she needs to make a safe medical decision, and physicians may not clearly communicate these information needs. Such communication problems result in physician and nurse dissatisfaction<sup>3</sup> and preventable medical errors.<sup>4</sup> Despite the importance of communication between hospital staff in preventing medical errors, surprisingly little attention has focused on bridging the communication gap between hospital floor nurses and on-call physicians.

Consider the following case (initials are fictitious):

Mr. J., a 35-year-old man with a history of alcoholism and recent binge drinking, is admitted with pneumonia.

## Article-at-a-Glance

**Background:** Communication failure is a common root cause of preventable medical errors affecting hospitalized patients. A study was conducted to determine the reasons for calls made by nurses working on the general medical wards to on-call physicians from 6:00 P.M. to 7:00 A.M.

**Methods:** A retrospective review was performed of a random sample of 500 inpatients admitted to general medical wards at an urban public teaching hospital in Houston between January 1, 2000, and February 28, 2003.

**Results:** In 139 (47%) of 293 medical records there were 304 documented calls. The majority of calls (81%) took place between 6:00 P.M. and 2:00 A.M., with peak call volume between midnight and 2:00 P.M. Patients with one or more calls had an average of 2.2 calls during their stay. Ten categories accounted for 65% of all the nurse calls. In 44% of calls, physicians responded by ordering a medication.

**Discussion:** Communication between floor nurses and on-call physicians might be improved by several interventions. Because 10 reasons accounted for 65% of after-hours calls, protocols could allow nurses to resolve some acute problems without physician involvement. For example, appropriate standing orders (e.g., P.R.N. medications) may prevent some calls. In addition, sign-out procedures can be tailored to address common problems that are likely to require future telephone communication. With efforts to change error-prone systems, it seems prudent to focus on after-hours coverage.

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On his first hospital night, at 3:00 A.M., Mr. J. complains of mild to moderate rib pain with coughing, which is keeping him awake, but has no order for acetaminophen. The nurse, Ms. M., who just took over the case, pages the on-call intern, Dr. S. Dr. S. is covering for another team and has no prior knowledge of this patient. Ms. M. requests pain medication and mentions that no acetaminophen orders have been written. Dr. S. asks why Mr. J. is admitted and is told "pneumonia." Ms. M. does not mention that Mr. J. is also an alcoholic with acute alcoholic hepatitis. Because the physician is not aware of the alcoholism, he agrees that acetaminophen is appropriate. Mr. J. receives one gram of acetaminophen (two extra-strength tablets), which is potentially lethal in an alcoholic. He develops fulminant hepatic failure.

The SBAR (Situation–Background–Assessment–Recommendation) communication structure provides a framework for communicating problems clearly and concisely. Participants are taught to first describe the situation, then provide background, an assessment, and, finally, a recommendation. SBAR as applied to the case would read as follows:

- Situation: "Mr. J. complains of mild–moderate rib pain with coughing."
- Background: "Mr. J. was admitted with pneumonia."
- Assessment: "We need to relieve his pain."
- Recommendation: "Tylenol may be appropriate in this patient."

This technique, which originated in the military, has been applied to health care.<sup>5</sup> Although SBAR may help structure the communication, it cannot point out the clinical facts that must be communicated. Specifically, it would still be up to the nurse to communicate relevant background (that Mr. J. also has alcoholic hepatitis) and to omit irrelevant background (for example, that he is on ceftriaxone for the pneumonia).

Increasingly, researchers and practitioners have shifted from blaming individuals to identifying and correcting error-prone systems.<sup>6,7</sup> Information management tools such as reminders, templates, checklists, and computerized decision support may bridge communication gaps, but are currently not widely used to facilitate after-hours communication. However, to deploy information management tools we need to know which acute patient problems prompt calls to on-call physicians.

We hypothesized that a small number of patient problems lead to the majority of telephone calls. To test this hypothesis and inform the design of information management tools, in January–March 2004 we performed a retrospective chart review at a large, urban public teaching hospital in Houston to identify the reasons for after-hours calls from floor nurses on general medical wards to on-call physicians.

### Methods

We used computer-generated random numbers to randomly select 500 medical records from all inpatients ( $N = 12,802$ ) discharged by the general internal medicine service between January 1, 2000, and February 28, 2003. The study protocol was approved by the Committee for the Protection of Human Subjects.

### RECORD REVIEW

Patients were included if they were admitted to the general medical ward for any portion of their hospital stay. All calls that took place during the stay on the general medical ward were included. Patients who were discharged by the general medicine team but not admitted to general medical units were excluded. In the study hospital, nurses are expected to document any call that they made to a physician regarding an acute patient problem. Therefore, all calls should have been documented in the chart.

### DATA COLLECTION

A registered nurse [K.K.P.] extracted information on each call made by a nurse working on the general medical unit to a physician between 6:00 P.M. and 7:00 A.M. We recorded patient demographics (birth year and gender), date of admission, date of discharge, length of stay on the general medical unit, and verbatim information for each call. The call information included the date, time, reason for the call, and physician response. Calls were identified by reviewing progress notes and orders in the medical record. Therefore, all calls that resulted in an order were captured, even if they were not documented in the progress notes.

Reasons for nurse calls were assigned [by K.K.P.] to one of 54 categories, which she created inductively from the data (Appendix 1, page 348). Similarly, physician responses were classified into one of 25 categories (Appendix 2,

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page 349). When calls were prompted by multiple reasons (for example, high blood pressure and high temperature), a new category was created for coding purposes. Therefore, each call was coded with a single category, and the category described all reasons for the call as recorded in the medical record. The objective was to create categories that would be easily identifiable by a nurse who is confronted by a particular patient problem. To measure inter-observer reliability, a second registered nurse independently coded all the reasons for the calls.

### RESIDENT CALL STRUCTURE AND SIGN-OUT PROCEDURE

Residents assigned to general internal medicine teams included interns (categorical, preliminary, and transitional), categorical internal medicine residents, and internal medicine–pediatrics residents. The data did not allow us to distinguish between different resident types responding to phone calls. In addition, some orders may have been given by attending physicians. During the period covered in the study, residents worked in teams—one resident with two interns (or two residents with four interns), supervised by an attending physician. Call was every fourth night, and a night-float system was in place. However, the function of the night float system evolved over time, partly because of changes in Residency Review Commission (RRC) rules. On-call interns generally received verbal sign-outs and documents that were amended and printed on a nightly basis.

### STATISTICAL ANALYSIS

A multivariate analysis of variance (ANOVA) was used to determine if there was an association between patient age, length of stay, and the number of after-hours calls from the nurse to the physician. An independent sample *t*-test was used to compare the length of stay for patients with or without calls. We used the Cohen's kappa statistic to assess interrater reliability of our coding scheme (that is, assignment of calls to categories).

## Results

### PATIENT SAMPLE

Of the 500 randomly selected records, 293 (59%) met the inclusion criteria. One hundred sixty-three patients (33%) who were never admitted to a general medical ward

but were instead housed on a non-general medical ward (for example, intensive care unit, step-down unit) were excluded from the analysis. The remaining 44 records (9%) were not available at the time of the study. Of the 293 patients, 233 (80%) were younger than 50 years of age, and 159 (54%) were men. The average patient age was approximately 50 years old at discharge (range, 19–93 years of age). Exact age could not be determined because only the birth year was recorded to maintain patient confidentiality per the Institutional Review Board protocol. The mean length of stay for the 293 patients was  $5.1 \pm 4.9$  days (range, 1–44 days).

### NUMBER OF CALLS

No calls were noted for 154 (53%) of the 293 patient records. A total of 304 calls were made for the 139 remaining patients, resulting in an overall mean of 1.04 calls per patient. Patients for whom no calls were made had a mean length of stay of 4.1 days, compared with 6.3 days for patients with at least one call ( $p < .0005$ ). The 139 patients for whom at least 1 call was made had an average of 2.2 calls during their stay. Of the 304 documented calls, 246 (81%) were made between 6:00 P.M. and 2:00 A.M., as shown in Figure 1 (page 345). The peak call period was midnight to 2:00 A.M., accounting for 76 calls. There was no statistically significant difference between patients less than or greater than 50 years of age with respect to the length of stay and number of calls (Wilks' Lambda = .962,  $p = .074$ ).

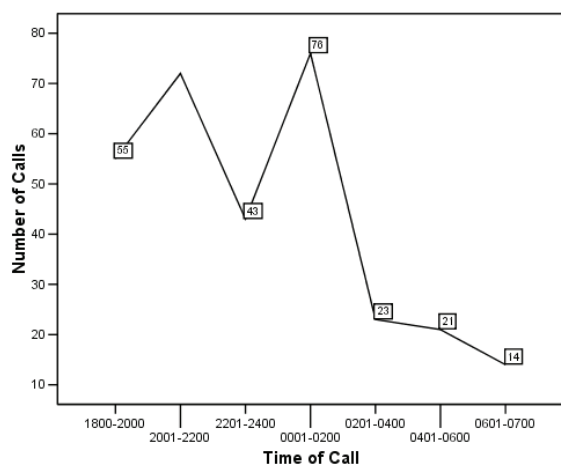
### REASONS FOR CALLS

The 10 categories of the most common reasons for calls accounted for 199 (65%) of the 304 calls (Table 1, page 346). Interrater reliability of nurse call categories was high (Cohen's kappa = 0.89). The discrepancies were largely confined to combination categories (for example, RN1: MEDICATION, BP vs. RN2: MEDICATION, BPLOW) and the relatively vague "ORDERS" category intended to refer to calls for order clarification. Given the high interrater reliability, resolving differences by consensus was not likely to significantly affect the results. Therefore, we used the original categorization for analysis.

Thirty-eight calls involved multiple reasons (for example, high temperature [fever] and high blood pressure); most of those calls (28 [74%] of 38) involved at least one

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### Time and Number of After-Hours Calls, January 1, 2000–February 28, 2003



**Figure 1.** The peak call period was midnight to 2 A.M. accounting for 76 calls.

of the 10 most common reasons. Specifically, 8 (21%) were coded as involving pain, 3 (8%) blood glucose (high or low), 10 (26%) high blood pressure, 11 (29%) high temperature (fever), 3 (8%) behavior, 3 (8%) medication, 2 (5%) nausea/vomiting, 0 (0%) procedure, 1 (3%) urinary, and 3 (8%) sleep difficulties.

Situations that required multiple calls on the same night might represent high-risk situations or communication failures. Therefore, we performed a subgroup analysis of these calls. Thirty-one patients required multiple calls on the same night. In this analysis, we included only the 86 calls that occurred on the night when multiple calls were required (that is, we did not include all calls made during the hospital stay). The average age of these patients was similar to the overall sample (52 versus 50 years of age), as were the reasons for the calls. Seven of the top 10 reasons for calls in the overall sample accounted for 59% of calls in this subgroup: blood glucose, behavior, high temperature (fever), pain, urinary issues, procedure-related, and high blood pressure.

#### PHYSICIAN RESPONSES

Physicians' responses to the calls are categorized in Table 2 (page 347). For multireason calls, the most common responses were the same: ordering a medication

(13/38 [34%]), not giving orders (13/38 [34%]), and coming to see the patient (4/38 [11%]).

Physician responses were also similar for the subgroup of situations that required multiple calls on the same night; ordering a medication (30/86 [35%]), not giving orders (24/86, [28%]), and coming to see the patient (7/86 [8%]). In a minority of cases (7/86 [8%]), no call back was received.

Physician responses varied according to the reason for the nurse's call, as shown in Table 3 (page 347). There were a total of 149 medication orders in 143 calls. In six cases, more than one medication was prescribed. In 135 cases, the physician's only response was a medication-related order. In eight cases, there were multiple actions including medication-related orders. The four most commonly ordered medications accounted for 45% of medication orders. There were 30 orders for acetaminophen (20%), 18 for insulin (12%), 12 for diphenhydramine (8%), and 8 for promethazine (5%). In 23 cases (8%), the medication was not recorded by the nurse or was not specifically identified (for example, "BP med").

#### Discussion

We found that 10 common reasons account for the majority (65%) of after-hours calls from floor nurses to the on-call physician. Nearly half the calls (47%) resulted in a medication-related order. Further, four common medications (acetaminophen, insulin, diphenhydramine, and promethazine) accounted for 45% of all medication orders. These findings suggest that algorithms and decision support systems can be developed to assist after-hours nurse-physician communication.

There are important limitations of our study. First, we relied on the medical record for all data. Reasons for calls may not have been recorded accurately, and some calls that did not require orders may have been omitted, although this would violate accepted nursing practice in the study hospital. If some calls were not recorded, it is possible that our estimate of the percentage of calls resulting in medication orders is too high. However, we were particularly interested in calls that resulted in orders because these would have the greatest potential to harm (or help). Alternatively, calls in which the physician did not give a verbal order but came to see the patient may not have been documented. Again, this would be a violation of accepted

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**Table 1. Nurse Call Categories**

Rank	Category	Frequency	%
1	Pain	36	11.8
2	Blood glucose (high or low)	31	10.2
3	Behavior (patient or family behavioral issues)	25	8.2
4	Blood pressure high	24	7.9
5	Temperature high (fever)	22	7.2
6	Medication (e.g., prescribe a medication, clarification of dosage or administration schedule)	14	4.6
7	Nausea/vomiting	12	3.9
8	Urinary (e.g., low urine output)	12	3.9
9	Procedure (e.g., unable start a peripheral intravenous, request central line)	11	3.6
10	Sleep difficulty	12	3.9
	Subtotal	199	65
11-52	Other reasons	105	35
	Total Nurse Calls	304	100

nursing practice at the study hospital. Further, these events are less interesting since any action taken would benefit from an in-person evaluation and would not rely entirely on phone communication.

Second, we did not examine the association between after-hours calls and errors, which has been found in previous studies.<sup>4</sup> Therefore, we cannot conclude that interventions based on the problems identified in this study would lead to a reduction in errors. For example, it is possible that the four medications that were involved in 45% of the medication orders (acetaminophen, insulin, diphenhydramine, and promethazine) are not involved in any adverse events. As a result, examining the relationship between specific after-hours calls and adverse events is a logical continuation of our work.

Third, our study was limited to a single urban public teaching hospital in the southwestern United States. Other settings, such as small rural hospitals without resident coverage in a different part of the United States, may have different call patterns. Fourth, hospital care is rapidly changing. Therefore, the patient sample captured in this study may not be representative of hospitalized patients in the future. Fifth, 9% of randomly selected medical records were unavailable for review. It is possible that these missing records may have significantly altered our findings.

Similarly, we did not examine the quality of physician-nurse communication. Finally, we cannot hope to account for all possible after-hours calls. For example, one of the authors has personally answered a call concerning patient self-emasculation [E.V.B.]

Several previous studies in a variety of settings have focused on physician responses to nurse calls. A study of all calls from nurses staffing an infant unit of a children's hospital to pediatricians, general surgeons, and a variety of subspecialists found that 10% of calls resulted in physician evaluations, similar to our finding of 9%. In that study, 35% of calls resulted in a verbal order being given over a telephone.<sup>8</sup> A survey of psychiatrists on call for a rehabilitation unit found that medication issues were the most common reason for calls (53%).<sup>9</sup> The top four issues requiring medication orders were pain, anticoagulation (warfarin) issues, glycemic control, and difficulty sleeping. Similarly, a study of internal medicine interns found that medication issues were the most common reason for calls and that 61% of the calls led to orders.<sup>10</sup> Overall, previous findings were similar to ours. However, these studies focused on physician responses rather than patient problems that prompted the call.

Fatigue, fragmented sleep, and discontinuity of care can lead to errors<sup>4,11</sup>; preventable medication errors are com-

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**Table 2. Physician Response Categories**

Rank	Category	Frequency (%)
1	Medication (only)	135 (44)
2	No orders	62 (20)
3	Evaluate patient	27 (9)
4	No call back to nurse	18 (6)
	Subtotal	242 (78)
	Other	62 (21)
Total Physician Responses		304 (100*)

\* Percentages do not equal 100% because of rounding.

mon.<sup>2,12</sup> In our study of after-hours calls, 47% of the physician responses involved medication-related orders. Therefore, our findings suggest that errors may be occurring as a result of after-hours calls. However, as stated above, we did not examine the relationship between after-hours calls and preventable medical errors. Further, although we found an association between length of stay and calls, this does not mean that the calls contributed to the increased length of stay. It seems more likely that severely ill, complicated patients, who stay in the hospital longer, are likely to have acute problems after-hours.

Communication between floor nurses and on-call physicians might be improved by several interventions based on our findings. Because 10 reasons account for 65% of after-hours calls, protocols could be developed to allow nurses to resolve some acute problems without physician involvement. Although floor nurses generally cannot prescribe medications, appropriate standing orders (for example, P.R.N. medications) may prevent some calls. In addition, sign-out procedures can be tailored to address common problems that are likely to require future telephone communication.

Given the finding that four medications—acetaminophen, insulin, diphenhydramine, and promethazine—were involved in 45% of medication-related orders, physicians taking phone call for patients hospitalized on general medical wards should be particularly well-informed regarding proper use of these agents or of equivalents that are used at their specific institution. Education efforts for incoming house staff should include the infor-

**Table 3. Physician Response Categories by Reason for Call**

Reason for call	Physician Response	Frequency (%)
Pain	Medication	30 (83)
	Evaluate patient	4 (11)
	No orders	2 (6)
	<b>Subtotal</b>	<b>36 (100)</b>
Blood glucose	Medication	19 (61)
	No orders	8 (26)
	Other	4 (13)
	<b>Subtotal</b>	<b>31 (100)</b>
Behavioral disturbance	No orders	7 (28)
	Medication	6 (24)
	Evaluate	4 (16)
	Intervention	3 (12)
	No call back	3 (12)
	Other	2 (8)
	<b>Subtotal</b>	<b>25 (100)</b>

mation necessary to safely use these agents.

Compared with other services, general internal medicine cares for the widest variety of hospitalized patients. Therefore, there are probably similar common categories for more specialized services, and our findings may be applicable beyond internal medicine. However, the categories may not be the same.

Decision support systems could be implemented that employ computerized reminders or clinical practice guidelines. Alternatively, they may be simple checklists printed on paper or laminated cards. The goal is to prompt clinicians to consider pertinent data, as for example, in inquiring about liver disease before ordering acetaminophen or requesting such an order to be given.

Nurses and physicians may not focus on the same factors when thinking about a patient problem.<sup>13,14</sup> Similarly, nurses' ratings of urgency may not be good predictors of physician response.<sup>8</sup> To put our findings into practice, we need to identify and validate the core information set required to answer common questions. For example, we need to identify the information required to safely handle

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### Appendix 1. Nurse Reasons for Calls

BP, blood pressure; P, pulse; R, respiratory rate; N/V, nausea and vomiting; TEMP, temperature.

1 ADMISSION	27 P
2 BEHAVIOR	28 PAIN
3 BLEEDING	29 PAIN,BPHIGH
4 BLEEDING,BP,P,R	30 PAIN,N/V
5 BLEEDING,BPHIGH	31 PAIN,N/V,BP
6 BLOOD GLUCOSE	32 PAIN,SKIN
7 BLOOD GLUCOSE,BEHAVIOR	33 PAIN,SLEEP DIFFICULTY
8 BLOOD GLUCOSE,BP	34 PROCEDURE
9 BLOOD GLUCOSE,PAIN	35 RESPIRATORY
10 BPHIGH	36 RESPIRATORY,TEMP,BP,P,R
11 BPHIGH,P	37 SEIZURE,BP
12 BPLOW	38 SKIN
13 BPLOW,MEDICATION	39 SLEEP DIFFICULTY
14 BPLOW,P	40 SLEEP DIFFICULTY,MEDICATION
15 DIET	41 SLEEP DIFFICULTY,P,R
16 DISCHARGE	42 SWELLING
17 DIZZINESS	43 TEMPHIGH
18 DIZZINESS,BEHAVIOR,BP	44 TEMPHIGH,BEHAVIOR,BPHIGH
19 ELIMINATION	45 TEMPHIGH,BPHIGH
20 FALL	46 TEMPHIGH,BPHIGH,P
21 FAMILY	47 TEMPHIGH,BPHIGH,P, R
22 LABS	48 TEMPHIGH,BPLOW,P
23 MEDICATION	49 TEMPHIGH,ORDERS
24 MEDICATION,BP	50 TEMPHIGH,PAIN
25 N/V	51 TEMPHIGH,PAIN,BPLOW,P,R
26 ORDERS	52 TEMPLOW,BPLOW
	53 URINARY
	54 URINARY,BP

uncontrolled pain over the telephone. Although no information set will be perfect, a small core information set including current medical problem list, medications, allergies, location and likely etiology of the pain will be better than nothing. A template with this information would prompt the nurse to obtain specific information before paging the physician and provide structure to the conversation. In our case example, a medical problem list containing alcoholic hepatitis may have prevented the potentially dangerous acetaminophen order. Using a pain protocol, a nurse requesting pain medications would review pain location, severity, palliative and provocative factors, the current problem and medication lists, allergies, vital signs (for example, respiratory rate), and previous orders for pain medications (for example, was acetaminophen stopped yesterday? If so, for what reason?). In future

work, we plan to implement and evaluate a set of simple paper-based protocols to be used by nurses before and during a phone call. A more sophisticated intervention may be computer-based and include a decision-support module that compares the current problem list, past medical history, and medication list against proposed medications (for example, acetaminophen should be used with caution in alcoholic hepatitis). Such a system has the potential to prevent some calls and to serve as a safety net for busy clinicians.

As we strive to change error-prone systems, it seems prudent to focus on after-hours coverage. Less experienced clinicians, both physicians and nurses, are likely to be overrepresented after hours.<sup>15</sup> Patient care is becoming increasingly fragmented because of limited house staff hours, the rise of dedicated hospitalists who do not have

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### Appendix 2. Physician Response Categories

- 1 APPROVAL
- 2 CLARIFICATION
- 3 COMMUNICATION
- 4 DIAGNOSTIC
- 5 DIAGNOSTIC,PROCEDURE
- 6 DISCHARGE
- 7 EVALUATE
- 8 EVALUATE, ORDERS
- 9 INTERVENTION
- 10 INTERVENTION,EVALUATE
- 11 INTERVENTION,MEDICATION
- 12 LAB, DIAGNOSTIC
- 13 MEDICATION
- 14 MEDICATION,DIAGNOSTIC,INTERVENTION
- 15 MEDICATION,DISCHARGE
- 16 MEDICATION,EVALUATE
- 17 MEDICATION,PROCEDURE,LAB
- 18 NO CALL BACK
- 19 NO ORDERS
- 20 NO ORDERS,WILL CALL BACK
- 21 NOT ASSIGNED PATIENT
- 22 PROCEDURE
- 23 RENEWAL ORDERS
- 24 TO UNIT
- 25 TREATMENT

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prolonged experience with the patient, and increasing specialization. In addition, hospitalized patients are more acutely ill than ever before. Therefore, the task of night nurses and on-call physicians is becoming more difficult. Future studies should identify on-call scenarios that lead to medical error and develop a core information set that needs to be communicated. We hope that this line of inquiry will lead to better communication and eventually to safer health care. **J**

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